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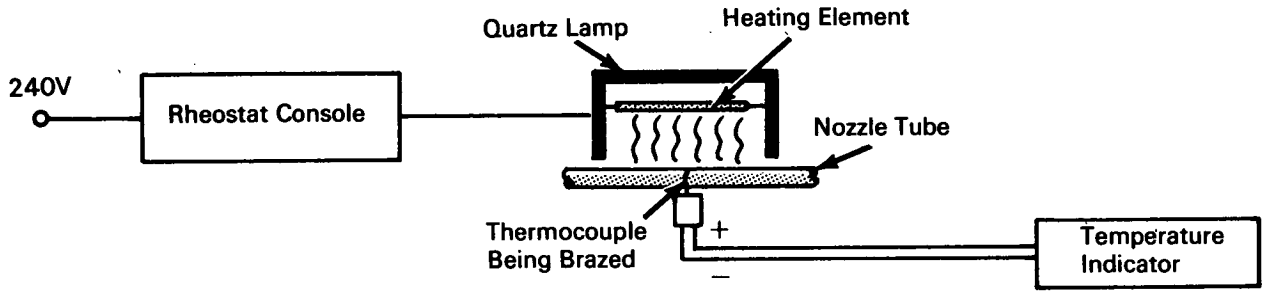
NASA TECH BRIEF

Microminiature Thermocouple Monitors Own Installation



The problem:

To make precision gas sidewall temperature readings inside large thrust chambers, it is essential that there be no disturbance to the thrust chamber tubes, thrust chamber coolant, or mainstream flow, and that there be no thermal shock damage to the sensor.

The solution:

A microminiature thermocouple that is installed by a technique whereby the sensor monitors its own installation to insure against thermal damage to the thermocouple and ensure minimum disturbance to chamber surfaces.

How it's done:

The thermocouple is brought to the gas side of the thrust chamber through small openings between the tubes. It is then bent to the tube contour and the tip (hot junction) is spot welded to the tube surface. A dam built of "stop-off" compound is built up around the thermocouple and a thin layer of powdered braze material is poured over the sensor. A quartz lamp, attached to a small rheostat console, melts the braze at a controlled rate that is dictated by the reading on a potentiometer connected to the thermocouple output leads. In this way, the thermocouple may be said to be monitoring its own installation.

Notes:

1. The braze must be selected on the basis of having a melting point in excess of maximum expected tube wall temperatures.
2. A perfect installation results in a thermocouple so concealed with minimum braze that its presence cannot be detected without sectioning the tube.
3. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B66-10463

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: J. P. Sellers, Jr. and A. J. Garrett
of North American Aviation, Inc.,
under contract to
Marshall Space Flight Center
(M-FS-1111)

Category 05